

COUNTRY BRIEFING CROATIA

Vienna Institute for International Economic Studies

Toward Innovation-driven Growth

Innovation Systems and Policies in EU Member States
of Central Eastern Europe

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EXECUTIVE SUMMARY

The EU member states of Central Eastern Europe (EU-CEE) – Poland, Czechia, Slovakia, Hungary, Slovenia, Croatia, Romania, Bulgaria, Estonia, Lithuania and Latvia – have undergone an impressive economic catch-up process since the early 2000s. However, the previously successful model of adopting labour-intensive production steps as an 'extended workbench' for Western corporations is increasingly reaching its limits, as we demonstrated in a previous study (Grieveson et al., 2021). The fundamental problem is that the key technological competencies and the segments of production with the highest added value are situated in the 'headquarter economies' of Western Europe. In contrast, the EU-CEE countries continue to specialise in labour-intensive production. Coupled with major structural changes such as decarbonisation and digitalisation, this growth model must therefore be replaced by a new one, more strongly driven by innovation. Only then will these countries be able to catch up with Western Europe in terms of productivity and living standards.

In a follow-up study (Zavarská et al., 2023), we investigated how a customised industrial policy could help EU-CEE countries to escape their 'middle-income trap'. The main finding: industrial policy needs to be stepped up in the region, all the more so at a time when countries around the world are rediscovering its significance. In this necessary effort to climb the technological ladder, there is much for EU-CEE to learn from the East Asian tiger states. They share a similar starting-point, namely the dominance of multinational corporations and a highly export-oriented nature, which the East Asian tigers have successfully leveraged to their advantage. With a highly successful industrial policy, these countries have managed to take the technological lead in some areas and create world-class companies, for instance in electronics or semiconductors.

Having established the need for a new growth model and made the case for industrial policy, we turn to innovation, the other 'missing piece' that will be required to achieve the next stage of convergence in EU-CEE. We explore how these countries could establish innovation systems at the national level, enabling them to catch up technologically and economically with the front-runners in Western Europe.

In this endeavour, EU-CEE countries face several challenges. For one, they do not spend enough on research and development (R&D), which undermines their innovation

activities. R&D expenditure is, however, slowly rising, particularly in Poland, Czechia and Croatia. Nevertheless, all countries in the region fall far short of the official EU target of 3% of GDP for R&D. Only Slovenia and Czechia record R&D expenditure of 2% of GDP, while Slovakia, Bulgaria, Latvia and Romania are below 1%. Although some countries excel in exporting medium and high-tech products, in many cases this is driven by foreign direct investment (FDI) and historical industrial strengths, rather than contemporary domestic innovation. As a result, high-level technological expertise mainly resides within large multinational companies that maintain extensive production sites in these countries, while R&D is carried out primarily in their Western European headquarters. This means that cutting-edge expertise and technology are only available on the 'islands' of the production plants of these companies in the EU-CEE countries. Because of this isolated existence, local companies, especially small and medium-sized ones, struggle to benefit from cutting-edge technology. Exports of innovative services are currently very limited.

Although the region has quite a high share of graduates in science, technology, engineering and maths (STEM subjects), the education system struggles to achieve quality and universities are underfunded. The region has a long way to go in green innovation, hampering its competitiveness in this crucial area of the EU's envisaged 'twin' (digital and green) transformation. By contrast, the region appears better positioned for the digital transformation. In particular, there are a number of emerging innovative enterprises in EU-CEE countries in digital technologies. However, many of them lack strong connections to the broader innovation system and tend to operate as isolated success stories.

Reflecting these challenges, the innovation performance of the region is not particularly promising, although there are some positive developments. With the exception of Estonia, all EU member states in Central Eastern Europe are below the EU average and outside the global top 30. However, the innovation performance is generally in line with the economic development of each country, albeit with some exceptions. Estonia clearly outperforms, while Poland, Slovakia and Romania underperform.

From the policy side, despite recent progress, an overarching problem is the lack of co-ordination and financial

support for innovation and R&D activities by national governments. The disconnect between FDI policies and innovation policies further complicates the implementation of strategies to enhance industrial innovation and upgrade EU-CEE's position in value chains. Although EU membership provides opportunities for collaboration and learning, the current innovation policy approach of the EU, which is focused more heavily on the needs of advanced countries, hinders active participation by EU-CEE countries. Only a few EU-CEE countries utilise their national policy space to engage more actively in EU initiatives.

IRELAND AND SINGAPORE AS ROLE MODELS

In this context, Ireland and Singapore can serve as an inspiration for EU-CEE, as they each successfully transitioned from an FDI-dominated to a more balanced innovation system, in which domestic firms actively contribute to the generation of innovations. Like the EU-CEE countries, their early economic growth was mainly driven by large multinational enterprises (MNEs) – similar to the 'extended workbench' model in EU-CEE. Later in their development stage, however, Ireland and Singapore changed their growth strategies. One notable element was the focus on a highly selective investment promotion approach (called 'innovation by invitation' in Ireland), which involved specifically attracting investments that corresponded to the country's own industrial strengths and potential. Additionally, a systematic and highly focused approach was taken to connect foreign companies with local firms and suppliers to establish industrial clusters in promising niches. Incentives were also created to encourage foreign companies already operating in the country to carry out more R&D locally, thus bringing in more added value.

A critical factor here was well-trained skilled labour. Both Ireland and Singapore have made great efforts to orient vocational training and, above all, university education in STEM subjects as closely as possible to the needs of their own economies. Other success factors included significant government funding of R&D through grants and tax breaks, the strengthening of scientific research at universities, the creation of government research funding agencies, the networking of university and commercial research, good framework conditions for start-ups, and easier immigration of highly qualified people from abroad.

POLICY RECOMMENDATIONS

Considering the specific innovation landscape of EU-CEE countries and building on the success stories from other parts of the world, this study articulates a series of recommendations aimed at guiding the EU-CEE region's next growth phase, advocating for a transition from imitation to innovation.

1. FACILITATE EFFECTIVE CO-ORDINATION OF THE INNOVATION SYSTEM

- Encourage the establishment of a long-term innovation strategy that provides stability and planning security and is not subject to the electoral cycle. This is linked to the creation of a central innovation agency to co-ordinate the various elements of a coherent innovation policy at the national level.
- Improve the utilisation of EU funds and provide more money at the national level for the promotion of innovation. From a converging country's perspective, the reality that EU-CEE can lean on EU finances is a substantial advantage, which needs to be leveraged more strongly.
- Improve the public administration and its institutions. In addition to expanding the pool of innovation policy experts within the public sector, this includes a shift towards a culture of evidence-based policy making, establishing and strengthening in-house capacities to analyse different policies and their interactions.

2. ENABLE COMPANIES TO CLIMB UP THE TECHNOLOGICAL LADDER

- Strengthen the innovative potential of domestic companies, helping them to upgrade and grow. Key strategies in this direction involve fostering local supplier development, offering targeted R&D incentives, as well as promoting clusters. Avoiding an arbitrary over-emphasis on high-tech sectors is also crucial, ensuring that innovation policies are locally relevant for realistic and effective outcomes in the region.
- Select FDI in a targeted way and focus on areas that align with the country's traditional industrial strengths in order to build upon them. Create incentives for foreign MNEs operating in the country to conduct more R&D locally, thereby bringing additional value.
- Connect MNEs operating in the country with local companies so that the latter can benefit from their technological expertise and know-how. Eventually, industrial clusters should emerge that reflect the country's strengths and specialisations.
- Identify and develop promising industrial niches. Facilitate a targeted specialisation of the economy in the most promising areas that offer the greatest comparative advantage. The EU-wide approach, known as 'smart specialisation', can be especially useful, as it seeks to achieve intelligent, inclusive and sustainable growth within the given economic conditions.
- Move away from tax incentives as the main instrument to stimulate R&D spending by companies towards more direct grants, especially in EU-CEE countries with fewer fiscal constraints.

3. STRENGTHEN UNIVERSITIES AND RESEARCH INSTITUTIONS

- Increase the exchange and improve networking between science and business. This includes making collaboration between universities and industry a prerequisite for certain types of funding, reviewing the regulatory frameworks governing publicly funded institutions, and establishing and actively using technology transfer offices, as well as participating in EU-wide initiatives that encourage the commercial application of research.
- Promote international partnerships and create opportunities for the cross-border mobility of researchers. There are various means of stimulating such partnerships, such as making research collaboration grants more widely available, negotiating various fellowship programmes (also within the EU-CEE region), and simplifying work permits and visa procedures for international researchers.
- Stimulate internationally outstanding scientific excellence. This should, however, be relevant to the local economy and its industrial base and take their needs into account.

4. DEVELOP HUMAN CAPITAL

- In order to have enough well-trained specialists available for an innovation-based growth model, vocational training and university education need to be expanded, especially in the STEM subjects of science, technology, engineering and mathematics.
- Talented workers from abroad should be recruited in a targeted manner, and skilled citizens who have emigrated should be enticed with special incentives to return home. It is well known that the EU-CEE countries are grappling with a pronounced 'brain drain' and, consequently, a significant shortage of skilled labour. This situation is often linked to challenging living conditions, ranging from expensive housing to a lack of childcare and inadequate healthcare. This also necessitates a new social policy to improve living conditions.
- Vocational training and apprenticeships should be made more attractive so that young, talented people follow these pathways, especially in technical and scientific fields. EU-CEE countries can build on the presence of MNEs to advance apprenticeship and internship programmes, career exploration programmes, and mentorship initiatives to ensure that students get hands-on experience from a relatively early age. The aim is to also ensure a more balanced talent distribution, so that high-achieving students are more drawn to, and can excel in, vocational pathways.

5. IMPROVE ACCESS TO FUNDING FOR INNOVATIVE COMPANIES

- In order to offer innovative companies better access to suitable financing from the outset, a legal framework and market conditions that reward innovation and risk-taking need to be cultivated. In particular, simplifying regulations, encouraging new fund creation, and promoting regional funds for smaller markets can be useful. Governments should cautiously explore co-investment mechanisms, avoiding disruption to private funding.

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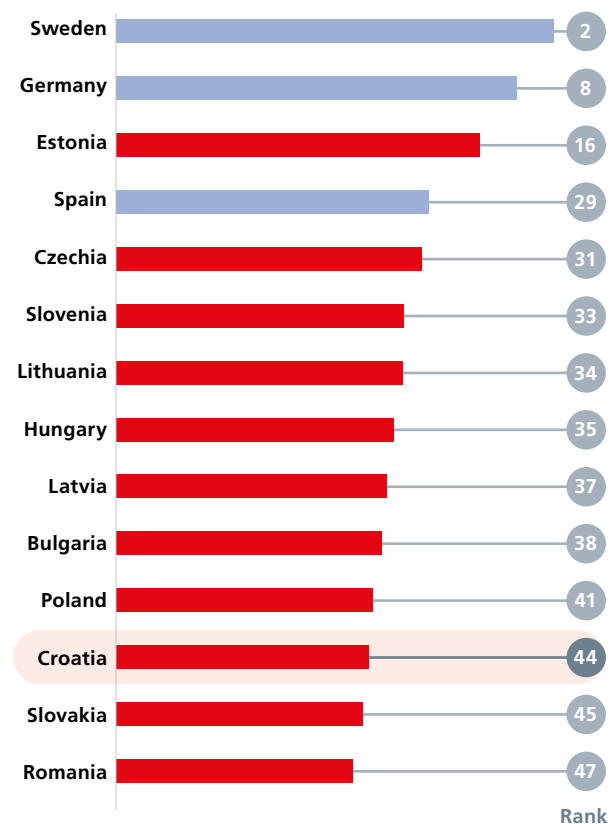
INNOVATION LANDSCAPE

With a performance well below the EU average, Croatia is still classified as an emerging innovator in the European Innovation Scoreboard. It is ranked 44th in the world in the Global Innovation Index, the third-lowest ranking among EU-CEE countries, which testifies to major room for improvement in the innovation system. Nevertheless, Croatia's innovation performance is in line with the country's development level¹ and recent efforts are bringing the country closer to the EU core. Croatia is confronted with the challenge of transforming its tourism-reliant economy into an innovative, knowledge-based one. This challenge is compounded by an underdeveloped institutional environment, shortages of ICT specialists and weak linkages between academia and industry, as well as low and decreasing research and development (R&D) expenditures and government support for business R&D. Owing to these limited efforts, the country is not producing enough exports of medium and high-tech manufactures and knowledge-intensive services. Patents are also insufficient; the number of patents per inhabitant is the lowest in the EU-CEE region.

Despite these challenges, there are some signs of progress. Croatia has a strong share of tertiary educated graduates in STEM subjects, and universities produce good-quality scientific publications. The country can count on a robust share of innovative small and medium-sized enterprises (SMEs), especially in the ICT sector. Croatia's accession to the EU in 2013 provided a boost to local IT companies and the ICT sector. Government modernisation efforts and enterprise investments have seen the ICT sector expand at a steady pace since 2017. Venture capital expenditures have been on the rise for several years, and Croatia is home to two 'unicorns': the communications platform Infobip, and the highly innovative car manufacturer Rimac Automobili, which is also participating in the second IPCEI (Important Projects of Common European Interest – an EU initiative) for batteries: European Battery Innovation (EuBatIn). Although Croatia's performance on patent applications is unsatisfactory, the country has improved its applications of other intellectual properties, in particular trademarks – a sign that less R&D-intensive innovations might be more relevant in the Croatian context.

¹ According to GII's expected vs. observed innovation performance.

Global Innovation Index – Rank 44 out of 132 countries



Source: GII 2023.

On the 'megatrends' of the twin transition, Croatia's performance is mixed, with a relative strength in the digital sphere offset by challenges in relation to the green transition, mirroring much of the rest of EU-CEE. With respect to the green transition, Croatia ranks in the 'catching-up group' on the European Commission's 2022 Eco-Innovation Scoreboard, with a fairly average performance by EU-CEE standards. Like other countries of the region, the scoreboard ranks Croatia strongly for innovation activities, but much less so for outputs, suggesting that significant efforts in this area are not yet sufficiently translating into specific outcomes. The lack of relevant green skills particularly hinders innovation activities in the country's transition to a net-zero economy. To tackle those deficiencies, Croatia earmarked the bulk share of 2021–2027 cohesion policy funds, some EUR 4.5bn, for green transition measures.

National Innovation System Indicators

Priority areas	Indicator	Croatia	EU	EU-CEE
Education system	Tertiary education graduates in STEM, share in % (UNESCO)	28.5	24	24.2
	Spending on tertiary education per student, in EUR at PPP (Eurostat)	4,600	7,990	6,600
	PISA scales in reading, maths and science (GII)	472	484	480
Technological capacities of enterprises	R&D (GERD) financed by business, share in % (Eurostat)	38.4	57.7	43.5
	R&D expenditures (GERD) in % of GDP (Eurostat)	1.2	2.3	1.3
	SMEs with product innovations, share in % (EIS)	34.6	27.0	22.8
	SMEs with business process innovations, share in % (EIS)	47.2	41.6	32.4
	Finance for start-ups and scale-ups, average perception scores from 0 to 10 (GII)	4.4	4.3	4.5
Collaborations and linkages	Innovative SMEs collaborating with others, share in % (EIS)	12.3	11.7	10.1
	University-industry R&D collaborations, average perception scores from 0 to 7 (GII)	3.0	4.2	3.8
Innovation outcomes	Granted patents per million inhabitants (WIPO)	17	586	86
	Exports of medium and high-technology products, in % of total product exports (EIS)	33.7	61.2	49.5
	Knowledge-intensive services exports, in % of total services exports (EIS)	24.3	63.6	48.6

Sources: EIS 2023; Eurostat; GII 2023; UNESCO; WIPO; World Bank, WDI.

Note: data for EU and EU-CEE are simple averages, except for EIS and Eurostat, with original data for EU.

Data for 2021 or the most recent available year; more details on the methodology and data availability to be found in the Annex.

Mapping innovation policy initiatives

	Yes/No	Name of the initiative/programme	Comments
Innovation agency	Yes	The Business Innovation Centre of Croatia – BICRO	BICRO was created in 1998 and is tasked with allocating state funds for R&D projects.
		National Innovation Council	The National Innovation Council was created in 2018 and focuses on the absorption of EU funds for innovation.
Programmes for human capital development	Yes	National Efficient Human Resources Programme	The programme is financed by the European Social Fund (ESF+) scheme and is aimed at upskilling the Croatian workforce in 2021–2027. It also provides scholarships for STEM studies. Croatia ran a similar programme in 2014–2020.
Programmes for human capital attraction and retention (e.g. reverse brain drain)	Yes	'I Choose Croatia' programme	Active employment scheme to attract human capital from abroad, focusing on underdeveloped areas and depopulated rural areas, including Slavonia, Dalmatinska Zagora, Banovina, Kordun, Lika and Gorski Kotar.
Start-up programmes (incubators, dedicated financing, etc.)	Yes	Start-up support scheme	The Croatian Bank for Reconstruction and Development (HBOR) provides loans (from EUR 50,000 to EUR 300,000) with a repayment period of up to 14 years for young entrepreneurs and start-ups.
Venture capital programmes	Yes	Croatian Venture Capital Initiative 2 (CVCi 2)	EUR 80m programme, jointly financed by the European Investment Fund and the Croatian Regional Development Ministry to support early-stage Croatian companies with high growth potential.

Cluster programmes	Yes	CEDRA programme (cluster for 'Eco-Social Innovation and Development' in Split-Dalmatia County) Association of Croatian ICT Clusters Croatian national cluster for the ICT industry Croatian Competitiveness Clusters (CCC) programme	CEDRA is an association founded in 2013, aimed at promoting social entrepreneurship, sustainable development and social innovations. The association prepares and implements projects financed from national, EU and other sources in co-operation with the public, private and civil sectors. It participates in local, regional, national and international projects and programmes. The association of Croatian ICT Clusters was founded in 2007 to connect and increase the collaboration within ICT clusters, located in Rijeka, Varaždin, Dalmatia, Istria, Slavonia and Medimurje. The Croatian national cluster for the ICT industry was founded in 2013 to provide a cooperation platform for local ICT companies. A 'Croatian Competitiveness Clusters' (CCC) programme was also launched for 48 months, from 2016 to 2020, as a tool to implement the Croatian Smart Specialisation Strategy.
Technology-specific policies	Yes	Digital Dalmatia; Southern European Entrepreneurship Engine (S3E) programme	Project launched by the Split-Dalmatia County, with the intention of encouraging and developing the ICT sector and to support start-ups in the county. The S3E Programme was founded in 2022 as part of Horizon Europe. It aims to support research teams to explore the commercial viability of deep tech start-ups and support them in their growing phase.
Tax incentive schemes	Yes	Tax incentives for technology investment (under the Investment Promotion Act)	Income tax reduction by 50% of the statutory rate for five years from the initial investment for 'micro enterprises', provided that a minimum of three new jobs had been created. For larger investments of up to EUR 1m, reduction of the income tax rate by 50% of the statutory rate for 10 years from the start of the investment, provided that the enterprise created a minimum of five new jobs.
Others		Eurostars 3 voucher programme – European Partnership on Innovative SMEs/Eurostars	Collaborative projects in the Eurostars 3 programme, co-funded by the EU's Horizon Europe scheme. The programme aims to promote co-operation between innovative Croatian SMEs and other partners (including large companies, universities, and research organisations) by funding international collaborative R&D and innovation projects.
Sector-specific initiatives		IPCEI 'European Battery Innovation' (EuBatIn) programme	Rimac Automobili is the Croatian partner in this IPCEI, tasked with performing three R&D battery systems projects and with setting up a R&D lab, a battery testing facility and a pilot production plant for the realisation and industrialisation of battery project results. Owing to the EuBatIn programme, Rimac Automobili is expected to emerge as a leading company in the European battery-system technology high-performance segment.

COUNTRY-SPECIFIC POLICY PRIORITIES AND RECOMMENDATIONS

- **Improve administrative capacity to strengthen innovation policy making and improve absorption of EU funds.** Croatia's innovation landscape faces challenges in the investment climate, owing to administrative barriers and inefficient bureaucracy. Improving the capacity of public administration and cultivating innovation expertise within these structures is necessary to strengthen the innovation system. A streamlined and more capable public administration would support the country's innovation landscape, for example, by facilitating a faster tendering process and by accelerating the absorption of EU funds. The proper absorption of EU funds should be prioritised to facilitate additional investments, given that EU funds act as one of the main drivers of Croatia's economic growth. Nevertheless, it is also paramount that the country increases national funding to innovation, to match EU funds and ensure continuity and buy-in of innovation policy initiatives.
- **Dedicate more funding to human capital development.** Given the challenges Croatia faces in diversifying away from tourism, human capital capable of contributing to the emergence and growth of more knowl-

edge-intensive industries is essential. For this reason, programmes for human capital development should be developed, especially to promote STEM education, particularly in relation to ICT. Indeed, the current low number of ICT specialists is considered a serious bottleneck for the development of the ICT sector and other industries related to the digital transition. Older workers – whether unemployed or in need of upskilling and reskilling – should also be targeted by these initiatives. In terms of upskilling and reskilling programmes, a valuable addition to Croatia's current skill set would be investment in green skills; digital skills seem relatively advanced across the population.

- **Expand government support to business R&D and non-R&D expenditures.** Government support to business R&D expenditures is currently too low by EU standards (and in some cases even by EU-CEE standards). Therefore, allocating more resources to R&D incentives is a key policy priority for Croatia. Although evaluation and reform of the tax incentives might help improve their uptake, expanding the offer of financial instruments and grants could also have an impact on the willingness of Croatian firms to engage in R&D. As for financial instruments, loans and venture capital are available, but the offer could be expanded to firms of all sizes and to other types of instruments, depending on an assessment of the real needs of the business sector. As for grants, the offer could be expanded to include grants for appropriate non-R&D expenditures, which could be also conditional on the achievement of certain milestones (i.e. the successful application for a trademark).
- **Identify promising niches and build them up.** Diversifying the Croatian economy is another imperative that requires innovation and industrial policies. Although this is a huge challenge, the country has already created a few pockets of excellence outside its core areas of specialisation. Building on the isolated successes such as Rimac Automobili, innovation policies could try to promote clusters and industries related to these successful domestic firms (such as specialised suppliers, service providers, providers of inputs and components). This exercise could also be undertaken in the process of designing the next smart specialisation strategy for the Programming Period 2021–2027. Indeed, by engaging in a more rigorous prioritisation exercise, Croatia could move away from broadly defined priorities (as specified in the 2014–2020 strategy) and make the S3 document its real blueprint to channel resources towards most promising niches for its future competitiveness.

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Toward Innovation-driven Growth: Innovation Systems and Policies in EU Member States of Central Eastern Europe

This country briefing contains a short summary of a much broader study that deals with the perspectives of innovation policies in Central Eastern and Southern Eastern Europe.

Twenty years after EU enlargement, the economies of Central and South Eastern Europe have become important components of Europe's industrial production system. Now, these countries are faced with the task of taking a new step towards a more sustainable and productive growth model.

This step can only be taken if the countries succeed in becoming innovating economies with national companies that are strong in research, development and innovation. To succeed, the countries have to develop not only strong industrial policies, but also policies that aim at creating solid national innovation systems. The study analyses the region's potential and uses the examples of Ireland and Singapore to describe successful innovation strategies. It is authored by a team from the Vienna Institute for International Economic Studies.

It is part of a series of FES studies on the growth model in EU-CEE and its prospects which have been published in recent years.

The full study can be found here:

<http://library.fes.de/pdf-files/bueros/budapest/21198.pdf>



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